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JOINT MEETING AMERICAN INSTITUTE OF
METALS AND BUREAU OF STANDARDS
COMMITTEES ON NON-
FERROUS METALS.

MESSRS. BURGESS AND KARR.



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American Institute of Metals

JOINT MEETING AMERICAN INSTITUTE METALS AND BUREAU OF STANDARDS COMMITTEES ON NON- FERROUS METALS.

September 5, 1913, at the Bureau of Standards.

Memorandum prepared by Messrs. Burgess and Karr.

The meeting held today was brought about by a desire of the Committee on Co-operation with the Bureau of Standards of the American Institute of Metals, to meet with a committee of the Bureau of Standards, together with representatives of the Committee on Non-Ferrous Metals of the A. S. T. M. and discuss the work which had been done in co-operation with the Bureau, to listen to the report on the work done in the Bureau of Standards' laboratories on Standard Test Bars, and to discuss the future work along similar lines of research. The gentlemen present were Director Stratton, Dr. Hillebrand, Dr. Burgess, Mr. Devres (representing Mr. Howard), Mr. Corse, Mr. Bassett, Mr. Cowan, Mr. Jones and Mr. Karr.

The morning meeting was opened by Dr. Hillebrand, who referred to some specimens of an alloy of sheet brass consisting theoretically of the regular constituents of copper and zinc with small increments of tin, lead and nickel and iron. He called particular attention to the variations obtained in the determination of the tin, showing a sheet of comparative analytical results which showed a range of 10% variation in the determination of the tin by 14 different analyses, and asked the question, on account of the inherent difficulty of the determinations, whether such an exhibition was a fair showing of the results we had a right to expect, with the ex-

ception of four results which were unusually low. Mr. Bassett and Mr. Corse thought it would be best to let the figures stand as shown and to issue a certificate either omitting these four results or appending a footnote stating that these four results were to be considered as abnormal. The lead determinations showed some discrepancies, but the determinations as PbSO_4 were in fair accord with one another; the copper determinations with one exception were in fair accord, also the zinc and nickel. Dr. Hillebrand enlarged upon the general variations in analytical results as shown by some of the best metallurgical chemists of the country.

Dr. Hillebrand also brought up the question of some red brass which had been sent to the Bureau of Standards by the Committee on Non-ferrous Metals, to determine and check methods of chemical analyses, and for distribution as standard samples. This alloy had a composition by mixture of 85% Cu., 5% Sn., 5% Zn., and 5% lead, but was unsatisfactory for the purpose, so that he thought that representative results could not be obtained from the alloy submitted. He questioned the propriety of submitting an alloy which contained such a large proportion of lead, as the tendency to liquation and a consequent inhomogeneous alloy could not be prevented. The oxidation of the lead in granulation and mixing seriously impaired the quality of the samples. Mr. Corse's answer to this criticism was that the alloy as proposed was a representative red-brass alloy and one that foundrymen would be apt to come across in their daily work and that it was essential that a method of analysis be developed which would take into consideration the presence of those four elements in such a combination. He considered it desirable to have Al and Fe included. Mr. Karr suggested that a three per cent lead alloy, with 85% Cu., 5% Sn., 6% Zn., 3% Pb., $\frac{1}{2}\%$ Fe and $\frac{1}{2}\%$ Al, would answer every foundry requirement, and after some general discussion this combination was accepted as a substitute, and it was agreed that the 600 lbs. of alloy sent to the Bureau be returned to Mr. Corse and that the metallic elements of the above alloy be sent to the Bureau in exchange, the Bureau to pay the difference in the value of compounding the alloy, viz.: about 2c per lb.

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The question of making the alloy was brought up and it was explained that such an alloy could be made in the usual foundry method by melting the copper first, adding the tin and lead and the minor ingredients and finally the zinc, but Dr. Hillebrand referred to a discussion he had had with Mr. Karr about the method to be employed in making such a composite alloy and the latter gentleman had recommended that the tin and lead first were to be melted and cast into ingot form or granulated, and then the copper and zinc, to which the iron and aluminum might be added, or the iron could be combined with the tin in the ratio of 33% of iron to 66% tin to form a hardening alloy which could be added in the proper proportion to the copper-zinc alloy, all of these various preliminary operations to be so made that the resulting binary alloys be put into a granulated state before the final combination was made. Mr. Bassett agreed with this method of preparation. Messrs. Corse, Cowan and Bassett agreed to furnish the ingredients, but it was decided that before hand, preliminary experiments be made at the Bureau of Standards to determine whether a homogeneous alloy of this type could be prepared, and also free from lead oxidation. It was also recommended that an L. & S. brand of copper be used. Horsehead zinc, Straits tin, and a special brand of St. Louis lead be obtained, the latter to be obtained through the courtesy of Mr. Cowan.

The work already done upon the Babbitt metals by the American Society for Testing Materials was brought up for discussion by Dr. Burgess, the irregularities of the method of making such Babbitt metal was discussed and also the method of preparing the samples was referred to at some length, also the method of taking samples for analysis was entered into. Dr. Hillebrand stated that it was essential in all such cases for one competent chemist or laboratory to make an analysis of all of the samples distributed.

Among the most important developments of the morning's meeting was the subject of the formation of a general committee on Non-Ferrous Metals to act in conjunction with and as advisory to the Bureau of Standards. This suggestion was

made tentatively by Mr. Corse and was to the effect that the Chairmen (and sub-chairmen) of the various committees on non-ferrous metals of the American Society for Testing Materials, the American Institute of Metals and the American Chemical Society, to form an advisory committee of the whole to act in co-operation with the Bureau of Standards upon all matters connected with the research work of the Bureau of Standards in reference to non-ferrous metals. Mr. Bassett, speaking as a representative member of the American Chemical Society, and the American Society for Testing Materials, expressed his opinion that both Societies would be pleased to act in such a capacity. Mr. Corse answered in the same manner for the American Institute of Metals. It was the sense of the meeting that this united committee should meet at Washington once or twice yearly to confer with the Director and members of the Bureau Staff about the work under way and future work.

Dr. Burgess brought up the subject of the nomenclature of the non-ferrous metals as illustrating a problem that could be dealt with by such a joint committee. Mr. Bassett explained that some years ago Mr. Herreschoff as chairman of a committee for the American Chemical Society had taken up the question and declared that the committee had reached the conclusion that nothing could be done, that in his company all the alloys in use were known by numbers, and that for their purposes to substitute names for numbers would be of no advantage, but this view while material as to the convenience of a corporation usage for purpose of manufacture, did not meet the question from the customer's point of view, and was not generally accepted as conclusive by the other gentlemen present. Dr. Burgess called attention to the abuse of distinctive personal and meaningless names being applied to alloys which gave no clue to their composition, nor to their functions, such as Stellite, Monel metal and others. Mr. Karr spoke of German Silvers being distinguished from one another by the appendage of a figure to denote the percentage of nickel implied, such as German Silver 18 or 20, meaning German Silver 18 or 20% nickel respectively, as a more suitable method.

The afternoon session was opened by the reading of Mr. Karr's report upon the work done at the Pittsburgh laboratories in reference to the determination of Standard size and shape test bars. (See report of Bureau of Standards, page 1). Mr. Jones expressed the opinion that the alloy of 88-10 and 2 was a difficult alloy to get uniform results with, as it was just on the border line of where a little variation either way in any of the constituents would affect its homogeneity. He suggested the elimination of all possible variables, such as not cutting the gates in the sand, but to have the patterns made of metal and set on a metal gate and so arranged on the pattern plate as to have a uniform feed. He also suggested that the molding be done on small molding machine so as to secure a uniform ramming of the sand, also that the moisture of the sand be kept as uniform as possible. Also that every time a heat of metal was poured into a sand mold that a bar be cast into a chill mold to afford a basis of comparison. Mr. Jones offered to furnish a set of patterns gated as he suggested and also with a chill mold. Mr. Corse referred to the work done at the Pittsburgh laboratories and stated that he was not at all surprised at the variations in tensile strength shown by the tests, that the results obtained by the Bureau were confirmatory and checked the work he had done in such an alloy and in similar alloys. The gentlemen present approved of continuing the work on the fourth series already begun and to be poured as suggested by Mr. Jones. It also appeared from the discussion that it is very difficult to get standard castings which will have the same properties as the usual castings of various shapes. The methods and properties of castings were discussed in some detail.

Other alloys more suitable for obtaining homogeneous castings were discussed, 76% Cu., 18% Zn., 3½% Lead, 3% Sn. and an alloy of 75% Cu. and 25% Zn. and 70% Cu. and 30% Zn., were favorably considered as being desirable to take up after the work on the alloy under study is completed. Physical tests are to be made after homogeneous bars were obtained in accordance with recommendations of Committee of Meeting of March 11, 1913.



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It is expected that the results of the work of preparation of the four series of casting experiments, with the alloy (88 Cu., 10 Sn., 2 Zn.) will be in the hands of the Committee before the October meeting, although it may not be possible to have completed all the tensile tests. The chemical and micrographical analyses are under way and typical thermal analyses (cooling curves) will also be ready for this series of alloys.

Joint Committee on Non-Ferrous Metals.

American Institute of Metals.

G. H. CLAMER, Chairman

J. L. JONES

C. R. SPARR

L. W. OLSON, *President*

W. M. CORSE (*Secy.-Treas.*)

Bureau of Standards.

S. W. STRATTON

G. K. BURGESS

J. E. HOWARD.

C. P. KARR.